

CAMDEN GAS PROJECT SOIL AND WATER MANAGEMENT SUB PLAN

AGL Gas Production (Camden) Pty Limited
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Document Control

Soil and Water Management Sub Plan

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1. Introduction

1.1. Introduction

This Soil and Water Management Plan (SWMP) has been prepared to supplement the Environment, Management Plan (EMP) for the Camden Gas Project ('the project' or 'CGP').

The SWMP has been developed based upon the previously approved SWMP prepared for the Elizabeth Macarthur Agricultural Institute (EMAI) Wells and the Razorback Wells prepared in response to Condition 8 (Sch 3) of Project Approvals O6-137 and O6-138. It has now been revised and updated to become the SWMP for all Camden Gas Project activities.

1.2. Purpose

The project activities can be summarised as the construction, operation, maintenance and rehabilitation of well sites, access roads/ tracks and gas gathering system, and the operation and maintenance of the Rosalind Park Gas Plant (RPGP) and the sales gas pipeline.

The requirement for an SWMP for the CGP is stipulated in a number of Development Consents and Project Approvals pertaining to the Project. Table 1-1 below lists the Development Consents, Project Approvals and Licences that require the preparation of an SWMP.

Table 1 1 Requirements for the Soil and Water Management Plan

| Consent | Condition No. | Requirement |
|---|---------------|--|
| DA -15-1-2002 Field – RPTP, Apap, Joe Stanley, Johndilo, Loganbrae, Lipscombe, Mahon | 20 (Sch 3) | Prepare and implement a Soil and Water Management Plan for the Camden Gas Project. |
| DA-246-8-2002 Field – Kay Park | 11 (Sch 3) | The Applicant shall amend the Environmental Management Plan required under Condition 15 of the consent for DA No. 15-1-2002-i dated 23 July 2002, to include the operation of KP01, KP02 and KP03 and the associated gas gathering system. |
| DA-282-6-2003 Fields – RPGP, Rosalind Park, Wandinong, EMAI (EM01-20, 38-40), Glenlee (GL05, 07-10, 14-17) | 84 (Sch4) | Prepare and implement a Soil and Water Management Plan for The Camden Gas Project Stage 2. |
| | 84A (Sch4) | Prepare and implement a Soil and Water Management Plan for the relocated Rosalind Park access road. |
| DA-183-8-2004 Fields – Mount Taurus and Menangle Park (MP13-17, MP30) | 14 (Sch 2) | The Applicant is required to prepare and implement a Water Management Plan for the sites and the Dam at MTO 1 for the life of the development. The Water Management Plan will include (and not be limited to) sediment and erosion control measures to be implemented prior to the construction of the earth Dam at gas well site MT01. The Applicant shall submit the Water Management Plan for the Director-General's approval within one month of the date of this consent. NB. This dam has been filled in and rehabilitated. |

| Consent | Condition No. | Requirement |
|--|------------------------------|--|
| | 16 (Sch 2) | Prepare and implement a Soil and Water Management Plan in relation to the connection of 15 existing coal seam methane wells to the Stage 2 Camden Gas Project – RPGP and construction of a dam at the Mt1 gas well site. |
| DA 75-4-2005 Field – Sugarloaf DA 171-7-2005 Field - El Bethel NB. Not commenced | 25 (Sch 2) 11 (Sch 3) | At least one week prior to the commencement of construction, the Applicant shall submit for the approval of the DG, an Erosion and Sediment Control Plan. The Plan must be implemented and used for the duration of all construction activities. The plan must describe the measures that will be employed to minimise soil erosion and the discharge of sediment and other pollutants to land and/or waters during construction activities. The Plan should be prepared in accordance with the requirements for such plans outlined in the Department of Housing’s Managing Urban Stormwater: Soils and Construction. |
| PA 06_137 Field – Razorback | 8 (Sch 3) | Prepare and implement a Soil and Water Management Plan in relation to the Razorback Wells (RB03 – RB12). |
| PA 06_138 Field – EMAI (EM23-37) | 8 (Sch 3) | Prepare and implement a Soil and Water Management Plan in relation to the Elizabeth Macarthur Agricultural Institute Wells (EM23-EM36). |
| PA 06_291 Fields – Spring Farm, Menangle Park | 9 (Sch 3) | Prepare and implement a Soil and Water Management Plan |

1.3. Objectives

The objectives of the EMP are described in Section 3.6 of the EMP. Objectives relating to the Soil and Water Management Plan are described below:

1.3.1. Construction

- › To minimise and where possible, prevent soil disturbance and contamination caused by construction.
 - » To prevent soil erosion.
 - » To prevent soil contamination.
 - » To appropriately control soil compaction.
 - » To appropriately manage construction activities in waterlogged and inundated soils.
 - » To prevent mixing of topsoil and subsoil.
 - » To ensure that soil exposure times between clearing and restoration are minimised.
- › Minimise the negative impacts of the construction on surface water resources.
 - » To maintain current surface drainage patterns.
 - » To maintain surface water quality.
 - » To ensure that windrows and soil stockpiles have been broken at appropriate places to allow natural surface water flow.

1.3.2. Operation Objectives

- › To promote and maintain soil stability.
- › To ensure there is no long-term erosion on compound areas.
- › To continue to monitor and manage soil erosion on the leased areas consistent with surrounding land and until the area has stabilised.

1.4. Targets

Targets relating to this Soil and Water Management Plan are outlined below:

- › Zero incidents relating to soil disturbance or contamination.
- › Zero incidents relating to water contamination from construction works or during operations.

1.5. Legal and Regulatory Framework

1.5.1. Key Statutory Requirements

All activities carried out on-site shall comply with all relevant legislation, regulations and guidelines. These include but are not limited to the legislation described below:

Protection of the Environment Operations Act 1997 (POEO Act)

- › The project holds an Environmental Protection Licence (EPL No. 12003) for premises including all the wells, the gas gathering lines and the Rosalind Park Gas Plant (RPGP) which is licensed for petroleum refining and generation and/or storage of hazardous, industrial or Group A wastes.
- › It is an offence wilfully or negligently cause any substance to leak, spill or otherwise escape in a manner that harms or is likely to harm the environment.
- › It is an offence to pollute waters under the Act.
- › Pollution incidents causing or threatening material harm are to be reported to the DECC (EPA).

Environmental Planning and Assessment Act 1979

- › Regulated by NSW Department of Planning (DoP). There are Development Consent Conditions and Project Approvals related to the Camden Gas Project that contain the requirement to prepare and implement a Soil and Water Management Plan (see table 1-1 above).

Water Management Act 2000

- › Controlled Activity Approval is required under Part 4 Development Consents for controlled activities when working on 'waterfront land' (within 40 m of a watercourse) (equivalent to former Part 3A Permits).
- › Water Access Licences and various other approvals are required for the extraction and use of water.

The Part 3A Permits and Controlled Activity Approvals held by AGL for the Camden Gas Project are listed in the EMP in Table 2-2 Summary of Approvals, Licences, Permits and Leases.

1.5.2. Regulatory Approvals, Licences and Leases

The soil and water management standards, performance measures and statutory requirements the project is required to comply with are outlined in the conditions of the consents, leases and licences listed in Table 1-2 below.

Table 1-2 Summary of Approval, Licence, Permit and Lease Requirements

| Consent / Title | Condition No. | Requirement |
|-----------------|-------------------------|--|
| Erosion | | |
| PEL 2 | 2 (Sch 2) 20 (Sch 2) | All practicable measures to minimise soil erosion and the discharge of sediments and water pollutants shall be implemented. |
| PPL 1, 2 | 2e | |
| PPL 4 | 2 (ii) | |
| DA 246-8-2002 | 28 (Sch 3) | |
| DA 282-6-2003i | 80, 127 (Sch 4) | |
| DA 75-4-2005 | 36-38 (Sch 2) | |
| PA 06_0137 | 8 (Sch 3) | |
| PA 06_0138 | | |
| PA 06_0291 | 10 (Sch 3) | |
| DA 9-1-2005 | 16 (Sch 2) | |
| | 17 (Sch 2) | The Applicant shall implement all relevant site drainage and sediment and erosion control works and measures prior to the commencement of any other works at the site. |
| PPL 5, 6 | 2 (ii) | The leaseholder must conduct operations in such a manner as not to cause or aggravate soil erosion and the lease holder must observed and perform any written instructions given or which may be given by the Minister with a view to minimising or preventing soil erosion. |
| DA 9-1-2005 | 10 (Sch 2) | Gas Gathering System and Access Roads – Gas gathering stream crossings may be trenched. For all trenched crossings, the natural bed and bank profiles are to be restored to their original condition, with smooth and even surfaces following installation of the gas pipe. |
| DA 171-7-2005 | 25 (Sch 3) | |

| Consent / Title | Condition No. | Requirement |
|--------------------------------|--------------------------|---|
| DA 15-1-2002i DA 171-7-2005 | 68 (Sch 3) 27(Sch 3) | The Applicant shall comply with the following in the construction of the gas gathering system pipeline: (a) Works within 20 m of watercourses are to be undertaken during dry weather conditions; (b) Signs stating the presence of a buried gas pipeline shall be erected periodically along the length of the trench once the pipeline has been laid; (c) Trenches are to be restored and reseeded with local grass seeds on completion of the work; (d) Construct the gas gathering system so as not to impeach lateral water flows; (e) Ensure that no crown or camber remains along the gas gathering systems, following construction; (f) Design, construct and operate the pipeline in accordance with the Australian Standard for the Installation and Maintenance of Plastic Pipe Systems for Gas AS 3723-1989 (or its latest version); and (g) Notify the Department on the completion of any trenching works. |
| DA 171-7-2005 | 30 (Sch 3) | Gas Gathering System and Access Roads – All erosion control matting used is to consist of biodegradable materials. No plastic netting is to be used for any purpose unless such netting is of a rapidly biodegradable variety. |
| PA 06_138 PA 06_137 | 17 (Sch 3) 15 (Sch 3) | The Proponent shall, to the satisfaction of the Director-General, ensure that: (a) pipelines are designed, constructed and operated in accordance with the Australian Standard for the Installation and Maintenance of Plastic Pipe Systems for Gas AS 3723-1989 (or its latest version); (b) the route of gas gathering and water transport systems and access roads follow previously or currently disturbed areas wherever possible (c) trenches are not left open overnight, unless adequately covered; (d) works within 20 metres of watercourses are only undertaken during dry weather conditions; (e) the pipeline crossing of Remembrance Drive is located at a depth of at least 1.2 metres below the road surface; (f) construction activities do not impede lateral water flows; (g) no crown or camber remains along any gas gathering system line, following rehabilitation; and (h) signs are erected at intervals along all gas gathering system lines indicating the presence of a buried gas pipeline. (d) routes of gas gathering and water transport lines are rehabilitated and reseeded with local grasses on completion of pipe laying. (i) the pipeline crossing of Finns Road is located at a depth of at least 1.2 metres below the road surface. |
| Water / Watercourses | | |
| DA 171-7-2005 | 14 (Sch 2) | Construction shall not commence until the Applicant has obtained a Part 3A Permit from the DNR (now DWE) under the Rivers and Foreshores Improvement Act 1948. |
| DA 75-4-2005 | 8 (Sch 2) | |

| Consent / Title | Condition No. | Requirement |
|-----------------|---------------|--|
| DA 183-8-2004i | 10 (Sch 10) | The applicant is required to ensure that the Dam at gas well site MT1 is appropriately lined so that waters stored in the dam do not potentially contaminate the surrounding and underlying soils. |
| DA 183-8-2004i | 11 (Sch 10) | The Applicant is not permitted to spray or discharge water from the earth Dam at gas well site MT01, onto any land or water surface unless it has prior written approval from the Director General. |
| | 12 (Sch 10) | The Applicant is required to store and manage the use and disposal of water in accordance with the current version of the Department of Environment and Conservation's Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-Liquid Wastes (this guideline has been superseded by Department of Environment and Climate Change's Waste Classification Guidelines, April 2008). |
| PPL 1, 2 | 2f, 6b | Maintain efficient means to prevent siltation of any stream or watercourse or catchment area. |
| PPL 1, 2 | 6c | Not interfere with the flow of water in any stream or watercourse. |
| DA 282-6-2003i | 78 (Sch 4) | Ensure that works within 20 m of watercourses are to be undertaken during dry weather conditions. |
| | 79 (Sch 4) | Ensure that the disturbance to the bed and banks of all watercourses are kept at an absolute minimum during the construction procedure and reinstatement of the site. |
| | 81 (Sch 4) | Minimise the amount of dirty water and sediment from sites entering protected waters. |
| DA 15-1-2002i | 57 (Sch 3) | All waste water that is used for dust suppression and / or irrigation has a salinity of less than 800 µS/cm |
| DA 246-8-2002i | 24 (Sch 3) | |
| DA 15-1-2002i | 56 (Sch 3) | Areas proposed to be used for waste water application can effectively utilise the waste water. This includes the use for pasture or crop production as well as ensuring the soil is able to absorb the nutrients, salts, hydraulic load and organic material in the liquids. |
| DA 246-8-2002 | 23 (Sch 3) | |
| DA 75-4-2005 | 49 (Sch 2) | The Applicant shall carry out the construction and operation of the development in a manner that will not adversely affect the structural integrity of the Upper Canal and associated structures nor impact the quality of water in the Upper Canal. The Applicant shall be responsible for ensuring that all persons involved in the development are informed of these requirements |
| | 50 (Sch 2) | The Applicant shall comply with the requirements in Sydney Water's Guidelines on Precautions to be taken when Building Over or Adjacent to Sydney Water Assets. |
| DA 171-7-2005 | 12 (Sch 2) | Well EB01 and associated works are to be located at least 40 m, measured horizontally and at right angles from the top of the bank of the Nepean River |
| | 13 (Sch 2) | Well EB02 and associated works are to be located at least 20 m, measured horizontally and at right angles from the top of the bank of the unnamed tributary of the Nepean River |
| Tracks | | |

| Consent / Title | Condition No. | Requirement |
|-----------------------|---------------|---|
| PEL 2 | 10 (Sch 2) | Access tracks must be kept to a minimum and positioned so that they do not cause any unnecessary damage to the land. Temporary access tracks must be ribbed, topsoiled and revegetated as soon as possible after they are no longer required. The use of any road or track must be restricted during wet weather to prevent damage. |
| Rehabilitation | | |
| PEL 2 | 23 (Sch 2) | Land disturbed must be rehabilitated to a stable and permanent form so that there are no adverse effects outside the disturbed area and the land is protected from soil erosion. |
| PPL 1, 2 | 2b | |
| PPL 5, 6 | 5 (Sch 2) | |
| DA 15-1-2002i | 72 (Sch 3) | |
| DA 282-6-2003i | 120 (Sch 4) | |
| DA 282-6-2003i | 83 (Sch 4) | Document the decommissioning of all sediment and erosion control works to the satisfaction of the Director-General and in accordance with the NSW Department of Housing's publication 'Managing Urban Stormwater: Soils and Construction' |



1.6. Responsibilities

Personnel responsible for implementing this environmental sub plan include the following:

1. Field Environment and Safety Officer responsible for informing site personnel of the required procedures for the protection of soil to prevent erosion, and water quality via an induction program.
2. Field Environment and Safety Officer, Project Manager and Land & Compliance Officer (or delegates) responsible for checking adherence to operating procedures and delegation of maintenance works on control measures.
3. Field Environment and Safety Officer and Head of Production responsible for reporting water discharge emission monitoring (including to DECC - EPA).
4. Field Environment and Safety Officer responsible for ensuring reasonable and feasible erosion controls installed and maintained.
5. Land & Compliance Officer responsible for landowner consultation with assistance from the Project Manager in addressing and managing complaints in relation to soil erosion and water management.
6. All employees are responsible for protection soil and water, from their work activities and working in a manner so as to minimise erosion and pollution.

2. Description of Activities

2.1. Potential Soil and Water Impacts

The project activities are described in detail in the main body of the EMP. The following activities have been assessed as having the potential to impact on local soil and water resources.

Table 2 1 Summary of Potential Impacts on Local Soil and Water Resources

| Activity | Potential Impact |
|--|---|
| Construction | |
| Installation/upgrade of access roads | Erosion of stockpiled topsoil |
| | Discharge sediment laden runoff |
| Construction of drill pad | Erosion of stockpiled spoil |
| | Discharge sediment laden runoff |
| Vehicle access | Erosion from track |
| | Damage undisturbed areas |
| Drilling / Fracing | Discharge sediment laden return water |
| | Erosion of drill pad |
| | Surface water becomes sediment laden |
| | Discharge sediment laden runoff |
| Construction of Gas Gathering Lines | Erosion of stockpiled spoil |
| | Damage undisturbed areas |
| | Discharge sediment laden runoff |
| Production and Operation | |
| Well Production, Operation, Inspection and Maintenance | Erosion of surface due to disturbance around access and equipment |
| | Discharge of produced water |
| Inspection and Maintenance of the Gas Gathering System | Erosion of surface due to disturbance around access and equipment |
| Inspection and Maintenance of the Sales Gas Pipeline | Erosion of surface due to disturbance around access and equipment |
| Initial Rehabilitation | |
| Initial well rehabilitation | Erosion of backfilled and rehabilitated excavation |
| | Compaction of soil |
| | Discharge sediment laden runoff |
| | Damage undisturbed areas |



| Activity | Potential Impact |
|---|--|
| Final Rehabilitation | |
| Backfilling and rehabilitation of gas gathering line. | Erosion of backfilled and rehabilitated excavation |
| Decommissioning of wells | Erosion of backfilled and rehabilitated excavation |
| RPGP Plant Operations | |
| Operation of gas treatment plant | Treatment and disposal of water from compressors at RPGP |
| | Gas gathering line water discharge |
| | Grey water and septic tank water discharge |

3. Management and Mitigation Measures

A range of soil and water control measures have been developed to be undertaken as part of the Project. This section describes the management and mitigation measures which will be put into place during various activities across the project.

3.1. General Operating Principles

AGL endeavours to minimise the environmental footprint of its activities. The following general operating principles are implemented in order to reduce the potential for soil erosion and impacts on surface waters:

- › Wells and gas gathering lines are sited on the periphery of land and along existing track and road verges to fit in with the primary land use and minimise land disturbance.
- › Operations, maintenance and construction employees including contractors are required to attend an induction prior to commencing work at each site to ensure that all personnel are aware of their HSE responsibilities and have the necessary knowledge and skills to fulfil them. It is the responsibility of the contractors to consult with AGL to prepare and implement an induction and job specific training program applicable to their work scope. Approval from AGL shall be obtained prior to implementation.

3.2. General Control Measures

Diversion drains, silt fences and check dams shall be used where practicable to divert surface water around disturbed areas and control runoff velocity.

3.2.1. Diversion Drains

Diversion drains - Diversion drains shall be constructed as necessary to divert surface water drainage away from soil stockpiles, drill pits and other disturbed areas in accordance with this plan. No area requiring diversion drains shall be left overnight without diversion drains unless approved by the Field Environment & Safety Officer (or delegate).

Diversion drains and other constructed waterways shall consider the design guidelines provided in Section 5.4.4 of Managing Urban Stormwater – Soils and Construction (NSW Department of Housing, 2004, now Housing NSW).

3.2.2. Silt Fences and Hay Bale Filters

Silt fences and/or hay bale filters as appropriate shall be installed when required in order to minimise sediment movement. They shall be installed around the downslope perimeter of disturbed areas where potential for significant sediment migration is identified by the Field Environment & Safety Officer and in accordance with Chapter 6.3.7 of Managing Urban Stormwater – Soils and Construction (NSW Department of Housing, 2004).

The following shall be used as determined by the Field Environment & Safety Officer:

- › Silt fences for low energy flows when filtering is the main aim; or
- › Hay bale filters where a degree of ponding or energy loss is required.

Silt fences shall:

- › Be of Siltfence2000 or equivalent;
- › Be no more than 0.6 metres high;
- › Be securely attached (for example by staples or plastic or wire ties) to support stakes (for example wooden stakes or star pickets) placed no more than 3 metres apart, driven into the ground or until firmly embedded;
- › Extend 0.15 metres below ground surface via excavation of a narrow trench which is backfilled after placement of the filter fabric;
- › Comprise a continuous roll where practicable. When joints are necessary, the filter fabric shall be spliced, or connected with plastic or wire ties or clips, with a minimum 0.15 metre overlap and securely fastened at both ends to posts; and
- › Be removed when no longer required.

3.2.3. Watercourse Crossings

Crossing of drainage channels/ water courses – Crossings of drainage channels/ water courses including gas gathering lines and access tracks shall address:

- › Installation of filter fence either side of the area of works, providing sufficient space between the filter fences for the works to be undertaken.
- › No stockpiling of soil within 5 metres of the bed of the drainage channel/ water course, unless the drainage channel/ water course is more than 20 metres wide. Where the drainage channel/ water course is more than 20 metres wide, stockpiles shall be placed at the direction of the Field Environment & Safety Officer.

Temporary waterway crossings – Temporary waterway crossings shall be constructed where roads traverse natural drainage lines in accordance with Chapter 5.3.4 of Managing Urban Stormwater – Soils and Construction (NSW Department of Housing, 2004). Where appropriate, barrier mesh (upslope) and sediment fencing (downslope) or similar materials shall be installed in accordance with details in Chapter 5.4.4 of Managing Urban Stormwater – Soils and Construction (NSW Department of Housing, 2004). Unrestricted vehicular plant access to undisturbed areas shall not be permitted.

3.2.4. Soil Stockpiles

Soil stockpiles – Soil stockpiles shall be constructed in accordance with details in Chapter 4.3 of Managing Urban Stormwater – Soils and Construction (NSW Department of Housing, 2004). Stockpiles shall have a maximum height of 3 metres and be battered to a maximum slope of 2(H):1(V). In the event of likely significant movement of material from the stockpile due to rainfall or wind, additional containment measures for the stockpile shall be implemented as directed by the Field Environment and Safety Officer.

3.2.5. Batters

Batters – The batters of completed embankments shall be less than 3(H):1(V). Immediately following completion of earthworks, batters shall be stabilised and disturbed areas shall be revegetated in accordance with Chapter 7 of Managing Urban Stormwater – Soils and Construction (NSW Department of Housing, 2004).

3.2.6. Rehabilitation

Well sites – Rehabilitation and Final Closure: When the gas reservoir has been drained (as determined in line with technical and commercial analysis) the surface equipment is removed, the well is plugged and abandoned in accordance with DPI - Minerals Guidelines and the site is fully rehabilitated to its previous state or better. The rehabilitation work is subject to the terms of the planning consent and consultation with the landowner.

Gas gathering system – Rehabilitation will include backfilling, compaction, replacement of topsoil, contouring and revegetation along the pipeline route.

3.3. Construction Pads

Where temporary and or permanent construction pads are proposed, the following steps should be undertaken:

- › Construct a Diversion Drain up-slope from any cut batters to intercept any surface run-off and direct it to safe disposal points;
- › Install a silt fence on the downslope side of the work area and at least 50% of the sides adjacent to the downslope edge of the work area;
- › Topsoil should be progressively stripped from areas to be disturbed and stockpiled separately from other excavated material;
- › Form cut and fill batters with a grade no steeper than 3(H):1(V); and
- › Progressively re-instate excavated material once activities associated with the pad have been completed.

Where permanent construction pads are proposed, the following additional steps should be undertaken:

- › Berms or benches are recommended on batters with a vertical height greater than 5 meters;
- › On small, steep embankments grass filter strips should be used to control sheet flow and sediment run-off. Typically these turf strips should be a minimum 300 mm wide.

3.3.1. Drilling

Prior to drilling, a polyethylene membrane lined drill pit shall be provided to retain drilling debris and associated water for the drilling process.

The drill pit(s) are dug and lined with polyethylene non-permeable liner (typically 2 m to 3 m deep). The drill pit(s) are provided to retain and recycle drilling debris and associated water for the drilling process.

The pit shall be bunded on the upslope side, the downslope side, and at least one other side. The fourth side may be left open for access provided that by doing so any overflow would not escape the bunded area. The bund on the accessible side may need to be constructed with much gentler slopes (in the order of 1V:10H) to allow plant movement over the bund.

All drilling debris and associated water from the drilling process shall be captured by the pit. Drill cuttings are to be buried approximately 2 m below ground level and coal fines are to be stored, then transported from the site and recycled. Any highly saline water will be transported from the site and reused on future drill sites or otherwise disposed at licensed disposal facilities.

A minimum freeboard of 300mm shall be maintained in the drill pit at all times.

3.4. Access Roads / Tracks

Access shall be restricted to formed tracks, either via existing tracks where possible, or new tracks to be constructed. Where new tracks are required to be constructed, or where existing tracks are required to be upgraded, the following controls shall be applied.

Any sections of track should be constructed, wherever possible by stripping the surface vegetation and topsoil. To limit erosion, track grades should be generally less than 10°. However, short lengths of steeper grades may occur on existing tracks or may be needed to negotiate difficult sections. Such sections would need to be shaled to allow free surface drainage and to avoid excessive ponding in wheel tracks.

Subsurface or recessed tracks collect runoff and can act as concentrated overland flow paths causing accelerated erosion. Where works are proposed to be undertaken to rectify erosion, these tracks should be re-constructed with either crowning, outfall or infall cross drainage. Where an existing track is located along a ridge or on gentler slopes and requires upgrading works, crowning (where the centre of the track is higher than the outside edges) should be used. Crowning can ease drainage problems because it allows water to shed to both sides of the track.

Where neither outfall nor crowning is suitable, infall drainage should be used. Infall drainage should be used in conjunction with drop down drains and culverts. Infall drainage may require culverts to be installed at regular intervals along the table drain to minimise erosion. Outlets of the culverts should be directed away from areas predisposed to erosion (i.e. poorly vegetated or bare areas as well as steep slopes and batters).

Where run-off cannot be controlled by crossfall drainage, cross drains or cross-banks may need to be used.

On new tracks, or those affected by erosion, the Department of Natural Resources, now the Department of Water and Energy (DWE), has recommended that cross banks should be constructed generally at the spacing indicated in Table 3-1.

Table 3 1 Road Grade and Soil Erodability

| Road Grade | Low Soil Erodability | High Soil Erodability | Very High Soil Erodability |
|------------|----------------------|-----------------------|----------------------------|
| Up to 8° | 70 to 90 m | 60 to 70 m | 20 to 30 m |
| 8° to 12° | 60 to 70 m | 50 to 60 m | # |
| 12° to 16° | 40 to 60 m | 30 to 40 m | # |
| 16° to 20° | 30 to 40 m | 20 to 30 m | # |
| 20° to 22° | 20 to 30 m | # | # |

Note (1) # AGL should seek additional guidance from DWE for tracks located in these situations

Note (2) Where trails are constructed on slopes exceeding 12°, only light and infrequent traffic should be permitted.

All formed batters should have a grade no steeper than 1(V): 3(H).

Access roads shall be constructed at an appropriate slope along contours where practicable.

Drainage controls – Spoon drains and diversion drains shall be used to control surface runoff from roads as appropriate.

Sediment filters – Sediment filters (silt fences or hay bale filters, as appropriate) shall be installed downslope of disturbance associated with construction of the internal main access road where the potential for significant sediment migration is identified as determined by the Field Environment and Safety Officer.

Temporary waterway crossings – refer to section on Temporary Waterway Crossings under Generic Control Measures.

Temporary diversion drains – Temporary diversion drains will be designed and constructed upslope of disturbed areas where the potential for significant runoff from the upslope undisturbed areas to the disturbed area is identified.

Surface finishing – Hardstand areas and access roads no longer required shall be ripped and rehabilitated.

Batters – Access road batters shall be stabilised through revegetation. The techniques to be used shall include the following as determined by the Field Environment and Safety Officer: hydroseeding, turfing, use of hay and bitumen, hay and wire netting, or erosion matting fabrics and direct planting.

3.4.1. Bed Level Crossings

Bed level crossings shall be in accordance with the recommendations of the Department of Water and Energy, as described below.

All crossings should be designed and located to:

- › Minimise site disturbance by having the road width as narrow as possible and the crossing at right angles to the flow rather than an oblique angle;
- › Accommodate natural flow regimes and geomorphic processes by minimising modification of the natural stream bed profile and bank form, not inhibiting sediment transport and not increasing water levels upstream; and
- › Avoiding detrimental impacts on ecological processes by providing passage for migrating flora and fauna.

To achieve these outcomes, the following Department of Water and Energy (DWE) requirements will be met:

- › Road crossings are to be at the same level as the natural bed level;
- › Scour protection will be installed in the creek bed downstream of the crossing;
- › A cutoff wall will be constructed on the downstream side of the crossing;
- › Scour protection will be installed on approaches where the track is cut into banks; and
- › No ponding will be allowed upstream of the proposed causeway for any waterfall effect downstream of the proposed structure.

The DWE further recommends that the stream crossing design should be prepared by suitably qualified person in consultation with the DWE.

3.5. Trenching (Gathering Lines)

Spoil from trenching shall be temporarily stockpiled adjacent to the trench on the upslope side of the trench where possible. Where a chain trencher is used, spoil may be stockpiled on both sides of the trench.

Topsoil should be stockpiled separately to the underlying soils. This means that there will be two windrows of material adjacent to the trench.

Silt fencing around the trench will only be required in areas within 50 metres of watercourses or other sensitive areas as identified by the Field Environment and Safety Officer.

The trench should be backfilled as soon as practical using the excavated spoil. If the trench is not backfilled on the day of excavation, consideration should be given to upslope protection of the stockpiled spoil. Such protection may be in the form of cut-off drains to divert surface waters from the stockpiled spoil, or silt fencing.

Stormwater caught in the trench may be used for dust suppression on adjacent areas. Stormwater shall not be discharged to existing waterways. Stormwater may be discharged across adjacent vegetated areas where grasses are sufficient to act as a natural filter.



3.5.1. Infrastructure Underboring

Underboring sites should follow the same requirements as well head locations with respect to controls around the perimeter of the work area. Suitably sized pits shall be used to capture underbore drill cuttings and drilling water.

3.6. Site Specific Management Measures

A documented layout of the erosion and sediment controls are prepared for each well surface location.

4. Monitoring and Maintenance

4.1. Monitoring Requirements

Table 4 1 summarises the monitoring requirements associated with soil and water management controls.

Table 4 1 Summary of Soil and Water Monitoring Requirements

| Management Practice | Monitoring | Responsibility | Timing |
|---|--|------------------|-----------------------------------|
| DA-282-6-2003-1 (Schedule 4, Clause 69 requires the following monthly monitoring: POINT 8 - Total suspended solids, Biochemical oxygen demand, Oil & Grease, Total polycyclic aromatic hydrocarbons, Phenols, Total organic carbon, Total petroleum hydrocarbons, Electrical conductivity, Water level in storage (monthly)). | Sampling as per DA requirement | AGL | Monthly sampling. |
| Develop and implement a Soil and Water Management Plan (SWMP) as part of the EMP with the main aim being to prevent sediment leaving the construction areas. | NA | AGL | Prior to and during construction |
| "Clean" stormwater within the site shall be allowed to discharge directly into the existing natural drainage system with no treatment and/or containment required. "Clean" stormwater runoff will be diverted around disturbed areas to minimise the volume of "dirty" water generated. | Weekly and after rain events | AGL | During construction |
| Keep working face and areas of open excavation to a minimum. | Daily during work | AGL & Contractor | During construction |
| Stabilise all disturbed areas as soon as practicable. | NA | AGL & Contractor | During construction |
| Minimise stockpiling by coordinating excavation, spreading, regrading, and compaction activities. | NA | AGL | During construction |
| Cover/vegetate stockpiles where material is to remain on site for a long period of time. | Daily inspections of stockpiles | AGL | During construction |
| Prevent the movement of sediment away from stockpiles and construction areas by installing temporary erosion and sediment control structures. | Weekly and after rain events | AGL | Prior to and during construction |
| Restrict traffic to defined roads. | Daily inspections | AGL & Contractor | During construction and operation |
| Minimise on-site vehicle activity on disturbed surfaces during and after wet weather events. | Daily inspections during and for a period after wet weather events | AGL | During construction and operation |
| Construct upslope diversion drains to collect and divert clean run-on waters around the work areas. | Weekly and after rain events | AGL & Contractor | During construction |

| Management Practice | Monitoring | Responsibility | Timing |
|--|---|------------------|--|
| Regularly inspect erosion control structures and banded areas. | Weekly and after rain events | AGL & Contractor | During construction and operation |
| Regularly inspect water levels in drill pits to ensure no spillage. | Weekly and after rain events | AGL & Contractor | During construction and operation |
| Regular inspection of the sales gas pipeline area to detect variations in surface conditions such as erosion. | Weekly (in conjunction with visits to well sites) | AGL | Throughout operation |
| Manage potential soil contamination by: appropriate and timely disposal of any contaminated spoil, water or waste generated during construction; decontamination of plant and equipment prior to leaving the construction site; removing accidental spills of soil or other material; banding of any refuelling area; and providing spill kits on site. | Daily during works | AGL & Contractor | Prior to construction, during construction and during operation. |

4.2. Maintenance Requirements

All sediment control devices shall be inspected prior to commencement of earth works, immediately following rainfall events as described below, and thereafter on a weekly basis.

The Field Environment & Safety Officer or delegate shall inspect sediment control structures and monitor water quality following rainfall events of 20 mm or more in a 24 hour period (within 48 hours of the event). The sediment control structures shall be inspected for capacity (i.e. sediment build-up), structural integrity (i.e. stability) and effectiveness (i.e. sediment containment) and maintained accordingly.

4.3. Records

The following records relating to monitoring and maintenance are to be maintained:

- > Drilling Operations Compliance Checklist;
- > Gas Gathering System Construction Checklist;
- > Well Checklist;
- > Rehabilitation Checklist;
- > Civil Construction Checklist;
- > Daily drilling report by drilling engineer (records any spills or other incidents);
- > Records of daily / weekly inspections during construction.

All records are to be maintained in compliance with record keeping requirements as outlined in Section 6.1 of the EMP.



5. Unplanned Events

5.1. Unplanned Discharges

In the event of an unplanned discharge, an inspection of the site shall be undertaken to make assessment on which of the control measures described in the SWMP for the site are required to be implemented.

In the event of a serious unplanned discharge, and where further discharge is imminently likely, works to cease until the imminent risk is removed. This may be by installation of additional control measures, repair of existing controls, or by increasing the capacity of existing detention basins or drill pits.

An assessment of whether any nearby watercourses have been impacted by the discharge, and whether any rehabilitation work, such as de-silting, is required.

Unplanned discharges shall be recorded on the Life Guard site through IRIS (AGL's Incident Reporting and Information System) as an Incident or Non-Conformance, with corrective and preventative actions to be determined and managed in accordance with existing Incident or Non-Conformance reporting procedures.



6. Administrative

6.1. Site Specific Plans

- › Currently not applicable

6.2. Attachments

- › Currently not applicable

6.3. Definitions

- › Currently not applicable

6.4. Life Guard References

AGL Life Guard Standard 19 – Environmental Aspects and Impacts